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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/276,273	03/25/1999	TYLER LOWREY	2024.17	1882
24963	7590	12/29/2004	EXAMINER	
ENERGY CONVERSION DEVICES, INC.			CAO, PHAT X	
2956 WATERVIEW DRIVE			ART UNIT	
ROCHESTER HILLS, MI 48309			PAPER NUMBER	

2814

DATE MAILED: 12/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/276,273

Applicant(s)

LOWREY ET AL.

Examiner

Phat X. Cao

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 October 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 258-268 and 276-289 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 258-268 and 276-289 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The Request for Continued Examination filed on 10/04/04 is acknowledged.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000.

Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. Claims 258-259, 261-268, and 276-277 are rejected under 35 U.S.C. 102(e) as being anticipated by Harshfield (US. 6,031,287).

Regarding claims 258-259 and 263-266, Harshfield (Fig. 24) discloses a memory element, comprising: a first dielectric material 110 having an opening 114, the opening having a sidewall surface and a bottom surface; a conductive material 124 (or 118, see Fig. 21) of titanium nitride (column 13, lines 31-40) lining the sidewall surface of the opening; a second dielectric material 122 (column 13, lines 41-47) formed over the conductive material 124 within the opening; and a programmable resistance material

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130 of chalcogenide phase change material (column 14, lines 1-5 and column 7, lines 5-12) electrically coupled to a top surface of the conductive material 124, the conductive material 124 having a substantially uniform thickness along the sidewall surface and having the top surface which has a lateral dimension less than the lateral dimension of the contact opening 114, wherein the lateral dimension of the contact opening 114 is about 0.06 um or 600 angstroms (column 13, lines 17-20 and column 9, lines 30-33).

Regarding claims 261-262, Harshfield further discloses that the contact opening 114 is a hole (Fig. 23) or a trench (Fig. 28).

Regarding claims 267-268, Harshfield (Fig. 24) also discloses that the conductive material 124 includes two protruding portions extending toward the programmable resistance material 130, and the first dielectric material 110 and the second dielectric material 122 are formed of the same material (column 13, lines 45-47).

Regarding claims 276-277, Harshfield (Fig. 24) also discloses that conductive material 124 has a dimension less than 500 angstroms because the lateral dimension of the conductive material top surface 124 is less than one-half the lateral dimension of the contact opening top surface 114 ($1/2 \times 600 \text{ angstroms} = 300 \text{ angstroms}$).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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5. Claims 260 and 278-289 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harshfield (US. 6,031,287) in view of Fukumoto (US. 6,307,264).

Regarding claims 260, 278-279 and 282-284, Harshfield (Fig. 24) discloses a memory element, comprising: a first dielectric material 110 having an opening 114, the opening 114 having a sidewall surface and a bottom surface; a conductive material 124 (or 118, see Fig. 21) of titanium nitride (column 13, lines 31-40) lining the sidewall surface of the opening 114; a second dielectric material 122 (column 13, lines 41-47) formed over the conductive material 124 within the opening; and a programmable resistance material 130 of chalcogenide phase change material (column 14, lines 1-5 and column 7, lines 5-12) electrically coupled to a top surface of the conductive material 124, the conductive material 124 being a sidewall spacer formed over the bottom surface of the opening and adjacent to the sidewall surface of the opening.

Harshfield does not disclose the conductive material 12 formed over a portion of the bottom surface of the opening and being less than the entire bottom surface of the opening.

However, Fukumoto (Fig. 13K) teaches the forming of a contact structure including: a first dielectric material 51 having an opening; a conductive material 56 lining the sidewall surface of the opening, the conductive material 56 being formed over a portion of the bottom surface of the opening; and a second dielectric layer 52 being formed over the remainder of the bottom surface of the opening. Accordingly, it would have been obvious to line the annular conductive material 124 of Harshfield either over a portion of or an entire bottom surface of the opening because the same effects of

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reducing the variation of wiring resistance and reducing the degree of dishing of the wiring would result, as taught by Fukumoto (column 2, lines 35-40).

Regarding claims 280-281, Harshfield further discloses that the contact opening 114 is a hole (Fig. 23) or a trench (Fig. 28).

Regarding claims 285-286, Harshfield (Fig. 24) also discloses that the conductive material 124 includes two protruding portions extending toward the programmable resistance material 130, and the first dielectric material 110 and the second dielectric material 122 are formed of the same material (column 13, lines 45-47).

Regarding claims 287-289, Harshfield (Fig. 24) further discloses that the conductive material 124 having the top surface which has a lateral dimension less than one-half of the lateral dimension of the contact opening 114, wherein the lateral dimension of the contact opening 114 is about 0.06 μm or 600 angstroms (column 13, lines 17-20 and column 9, lines 30-33).

Response to Arguments

6. Applicant's arguments with respect to the claimed invention have been considered but are moot in view of the new ground(s) of rejection.

The new references are applied in the new ground of rejection(s) to show the obviousness of the invention as claimed.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phat X. Cao whose telephone number is (571) 272-1703. The examiner can normally be reached on Monday - Thursday.

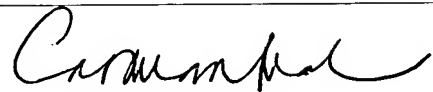
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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PC

December 23, 2004



PHAT X. CAO
PRIMARY EXAMINER